

APPENDIX A

List of Known ETS Constituents

Appendix A

List of Known ETS Constituents

| Constituent | Reference |
|-------------------------------|------------------|
| γ -Butyrolactone | 3,4,8 |
| β -Carboline | 3 |
| β -Carotene | 3 |
| α -Ketoglutaric acid | 5 |
| β -Methylvaleric acid | 5 |
| β -Phenethyl alcohol | 5 |
| γ -Sitosterol | 5 |
| β -Sitosterol | 5 |
| α -Socratine | 5 |
| β -Socratine | 5 |
| γ -Socratine | 5 |
| 1,12-Benzoperylene | 5 |
| 1,1-Dimethylhydrazine | 6,7 |
| 1,2,4-Trimethylbenzene | 5 |
| 1,2-3,4-5,6-Tribenzanthracene | 5 |
| 1,2-3,4-Dibenzopyrene | 5 |
| 1,2-5,6-Dibenzanthracene | 5 |
| 1,2-7,8-Dibenzoflourene | 5 |
| 1,2-7,8-Dibenzonaphthacene | 5 |
| 1,2-Benzanthracene | 5 |
| 1,2-Benzofluorene | 2,5 |
| 1,2-Benzonaphthacene | 5 |
| 1,2-Benzopyrene | 5 |
| 1,3,5-Trimethylbenzene | 5 |
| 1,3,5-Trimethylbenzene | 5 |
| 1,3,5-Trimethylbenzene | 5 |
| 1,3-Butadiene | 1,5,6,7 |
| 1,3-Dimethoxypyrogallol | 3 |
| 1,8,9-Perinaphthoxanthene | 5 |
| 1,8-Dimethylnaphthalene | 5 |
| 1,8-p-Menthadiene | 5 |
| 11,12-Benzofluoranthene | 5 |
| 1-Aminonaphthalene | 1 |
| 1-Azafluoranthene | 3 |
| 1-Azapyrene | 3 |
| 1-Methylchrysene | 5 |
| 1-Methylnaphthalene | 2 |
| 1-Methylpyrene | 5 |
| 1-Naphthol | 3,5 |

| | |
|------------------------------|-----------|
| 1-Naphthylamine | 3,7 |
| 2- Aminonaphthalene | 1 |
| 2,1-Naphtho-1,2-fluorene | 5 |
| 2,3'-Bipyridyl | 3 |
| 2,3-Benzofluorene | 5 |
| 2,3-Butanedione | 5 |
| 2,3-Dimethylaniline | 3 |
| 2,3-Dimethylmaleic anhydride | 3 |
| 2,3-Dimethylpyrazine | 3 |
| 2,3-Pentanedione | 5 |
| 2,4-Dimethylaniline | 3 |
| 2,4-Lutidine | 3 |
| 2,4-Xylenol | 5 |
| 2,5-Dimethylaniline | 3 |
| 2,5-Dimethylphenanthrene | 5 |
| 2,5-Lutidine | 3 |
| 2,6-Dimethylaniline | 3,6 |
| 2,6-Dimethylpyridine | 5 |
| 2,6-Lutidine | 3 |
| 2',3'-Naphtho-3,4-pyrene | 5 |
| 2-Aminobiphenyl | 3 |
| 2-Ethylaniline | 3 |
| 2-Methyl-1-naphthylamine | 3 |
| 2-Methylanthracene | 5 |
| 2-Methylfuran | 5 |
| 2-Methylnaphthalene | 2,5 |
| 2-Methylpyridine | 3,5 |
| 2-Naphthol | 3,5 |
| 2-Naphthylamine | 3,4,6,7,8 |
| 2-Nitropropane | 1,3,6,7 |
| 2-Picoline | 3 |
| 2-Toluidine | 1,4,6,7,8 |
| 2-Vinylphenol | 3 |
| 3,4-8,9-Dibenzopyrene | 5 |
| 3,4-9,10-Dibenzopyrene | 5 |
| 3,4-Benzofluoranthene | 5 |
| 3,4-Benzopyrene | 5 |
| 3,4-Dihydro-3,4-benzopyrene | 5 |
| 3,5-Xylenol | 5 |
| 3-Aminobiphenyl | 1,3 |
| 3-Ethenylpyridene | 1 |
| 3-Ethylaniline | 3 |
| 3-Hydroxyisoeugenol | 3 |
| 3-Methylpyridine | 8 |
| 3-Methyl-1,2-benzanthracene | 5 |

| | |
|----------------------------------|---------------|
| 3-Methylcatechol | 3 |
| 3-Methylpyrene | 5 |
| 3-Methylpyridine | 3,4,5 |
| 3-Picoline | 3 |
| 3-Pyridyl ethyl ketone | 5 |
| 3-Pyridyl methyl ketone | 5 |
| 3-Pyridyl propyl ketone | 5 |
| 3-Vinylphenol | 3 |
| 3-Vinylpyridine | 3,4,6,8 |
| 4-Aminobiphenyl | 1,3,4,6,7,8 |
| 4-Azafluorene | 3 |
| 4-Ethylcatechol | 3 |
| 4-Methylcatechol | 3 |
| 4-Methylpyrene | 5 |
| 4-Picoline | 3 |
| 4-Vinylcatechol | 3 |
| 4-Vinylguaiacol | 3 |
| 4-Vinylpheno | 3 |
| 5,6-Cyclopentenobenzanthracene | 5 |
| 5-Methylchrysene | 1,3,6 |
| 6,7-Cyclopentenobenzanthracene | 5 |
| 7,8-Benzofluoranthene | 5 |
| 7H-Dibenzo[c,g]carbazole | 1,3,5,7 |
| 8,9-Benzofluoranthene | 5 |
| 8-Methylfluorene | 5 |
| 9,10-Dimethyl-1,2-benzanthracene | 5 |
| 9-Methyl-1,2-benzofluorene | 5 |
| 9-Methylfluorene | 5 |
| 9-Methylphenanthrene | 5 |
| A fluorenecarboxyic acid | 5 |
| AaC | 6 |
| Acenaphthene | 2,5 |
| Acenaphthylene | 2,5 |
| Acetaldehyde | 1,3,5,6,7 |
| Acetamide | 6,7 |
| Acetic acid | 3,4,5,6,8 |
| Acetone | 1,3,4,5,6,8 |
| Acetylene | 5,6 |
| Acridine | 3 |
| Acrolein | 1,3,4,5,6,7,8 |
| Acrylamide | 6 |
| Acrylonitrile | 1,6,7 |
| Adipic acid | 5 |
| Aluminum | 5 |
| Ammonia | 1,3,4,5,6,8 |

| | |
|----------------------------------|----------------|
| Anabasine | 3,5,6 |
| Anatabine | 3,4,5,6,8 |
| Aniline | 4,6,7,8 |
| Anodmine | 5 |
| Anthanthrene | 5 |
| Anthracene | 1,2,3,5 |
| Anthraceno-2,3-9,10-phenanthrene | 5 |
| Arachidic acid | 5 |
| Argon | 6 |
| Arsenic | 1,5,6,7 |
| Azulene | 5 |
| Benz[a]acridine | 3 |
| Benz[c]acridine | 3 |
| Benz[f]indene | 3 |
| Benzaldehyde | 5 |
| Benzene | 1,3,4,5, 6,7,8 |
| Benzimidazole | 3 |
| Benzo[a]pyrene | 1,2,3,4,5,7,8 |
| Benzo[a]anthracene | 1,2,3,4,7,8 |
| Benzo[b]fluoranthene | 1,2,3,7 |
| Benzo[b]fluorene | 3 |
| Benzo[b]furan | 3,6 |
| Benzo[c]fluorene | 3 |
| Benzo[c]phenanthrene | 3 |
| Benzo[e]pyrene | 3 |
| Benzo[f]quinoline | 3 |
| Benzo[ghi]perylene | 3 |
| Benzo[h]quinoline | 3 |
| Benzo[jj]fluoranthene | 1,3,7 |
| Benzo[k]fluoranthene | 1,2,3,7 |
| Benzo[m,n,o]fluoranthene | 5 |
| Benzoic acid | 3,4,5,8 |
| Benzophenanthrene | 5 |
| Benzyl alcohol | 5 |
| Beryllium | 1,6 |
| Butane | 5 |
| Butylbenzene | 5 |
| Butyraldehyde | 1,5 |
| Butyric acid | 5 |
| C25-C33 paraffins | 5 |
| Cadmium | 1,4,5,7,8 |
| Caffeic acid | 3,6 |
| Calcium | 5 |
| Campesterol | 3,6 |
| Caproic acid | 5 |

| | |
|--|---------------|
| Caprylic acid | 5 |
| Captan | 7 |
| Carbazole | 3 |
| Carbon dioxide | 3,4,5,6,8 |
| Carbon monoxide | 1,3,4,5,6,7,8 |
| Carbon oxysulfide | 5 |
| Carbonyl sulfide | 3,4,8 |
| Catechol | 1,3,4,5,6,8 |
| Cerotic acid | 5 |
| Chlorinated dioxins and furans | 1 |
| Chlorogenic acid (3-o-caffeooyl-d-quinic acid) | 3 |
| Cholesterol | 4,6,8 |
| Chromium VI | 1,5,6,7 |
| Chrysene | 1,2,3,5,7 |
| Cichoriin | 3 |
| Cobalt | 6 |
| Collidine | 5 |
| Copper | 5 |
| Coronene | 3,5 |
| Cotinine | 3,5 |
| Coumarin | 3 |
| Crotonaldehyde | 1,3,5 |
| Cyanogen | 5 |
| Cycloartenol | 3 |
| Dibenz[a,j]anthracene | 3 |
| Dibenz[a,,j]acridine | 3,7 |
| Dibenz[a,c]anthracene | 3 |
| Dibenz[a,h]acridine | 1,3,7 |
| Dibenz[a,h]anthracene | 3,7 |
| Dibenz[a,j]acridine | 1,3,7 |
| Dibenzo[a,e]fluoranthene | 3 |
| Dibenzo[a,e]pyrene | 7 |
| Dibenzo[a,h]pyrene | 3,7 |
| Dibenzo[a,i]pyrene | 1,3,7 |
| Dibenzo[a,l]pyrene | 3,7 |
| Dibenzo[b,d]furan | 3 |
| Dibenzo[c,g]carbazole | 6 |
| Diethyl ketone | 5 |
| Diethylene glycol | 5 |
| Dimethylamine | 5 |
| Dimethylchrysene | 5 |
| Dimethylfluoranthene | 5 |
| Dimeyhtlamine | 4,5,8 |
| Dipentene | 5 |
| Dipropyl ketone | 5 |

| | |
|---------------------------------------|-------------|
| Ergosterol | 3 |
| Esculetin | 3 |
| Ethane | 5 |
| Ethanol | 5 |
| Ethyl β -methylvalerate | 5 |
| Ethyl acetate | 5 |
| Ethyl carbamate | 6 |
| Ethyl isovalerate | 5 |
| Ethyl <i>n</i> -butyrate | 5 |
| Ethyl <i>n</i> -caproate | 5 |
| Ethyl propionate | 5 |
| Ethylamine | 5 |
| Ethylbenzene | 1 |
| Ethylene | 5 |
| Ethylene glycol | 5 |
| Ethylene oxide | 6 |
| Ethylphenols | 3 |
| Eugenol | 3 |
| Ferulic acid | 3 |
| Fluoranthene | 3,6 |
| Fluoranthene | 2,5 |
| Fluorene | 2,3,5 |
| Formaldehyde | 1,3,4,5,6,8 |
| Formic acid | 3,4,5,6,8 |
| Furan | 5,6 |
| Furfural | 5 |
| Furoic acid | 5 |
| Glu-P-1 | 6 |
| Glu-P-2 | 6 |
| Glutamic acid | 5 |
| Glutamine | 5 |
| Glutaric acid | 5 |
| Glycerol | 5,6 |
| Glycolic acid | 3,4,8 |
| Guaiacol (2-Methoxyphenol) | 3,5 |
| Gudham | 5 |
| Harman (1-methyl- β -carboline) | 4,8 |
| Heptylic acid | 5 |
| Hydrazine | 1,3,4,6,8 |
| Hydrogen cyanide | 1,3,4,5,6,8 |
| Hydrogen sulfide | 5,6 |
| Hydrogen thiocyanide | 5 |
| Hydroquinone | 1,3,5,8 |
| Indeno[1,2,3-cd]pyrene | 1,3,6 |
| Indole | 3,6 |

| | |
|-----------------------|-----------|
| Ionene | 3 |
| IQ | 6 |
| Iron | 5 |
| Isobutane | 5 |
| Isobutylene | 5 |
| Isobutyraldehyde | 5 |
| Isobutyric acid | 5 |
| Isoeugenol | 3 |
| Isoprene | 1,5,6 |
| Isopropylbenzene | 5 |
| Isoquinoline | 3 |
| Iosqualene | 5 |
| Lactic acid | 3,4,5,6,8 |
| Lathrein | 5 |
| Lauric acid | 5 |
| Lead | 1,5,6,7 |
| Levantenolide | 3 |
| Levulinic acid | 5 |
| Limonene | 6 |
| Linoleic acid | 3,5,6 |
| Linolenic acid | 3,5,6 |
| Lohitam | 5 |
| Lutidine | 5 |
| Magnesium | 5 |
| Maleic anhydride | 3 |
| Maleic hydrazide | 6 |
| Malic acid | 5 |
| Malonic acid | 5 |
| Manganese | 5 |
| m-Cresol | 1,3,5 |
| Mercury | 1 |
| Mesitol | 5 |
| Methane | 5,6 |
| Methanol | 3,5,6 |
| Methyl acetate | 5 |
| Methyl chloride | 4,5,8 |
| Methyl ethyl ketone | 1,5 |
| Methyl formate | 6 |
| Methyl nitrate | 5 |
| Methylacetylene | 5 |
| Methylamine | 4,5,6,8 |
| Methyleugenol | 6 |
| Methylglyoxal | 5 |
| m-Hydroxyacetophenone | 5 |
| m-Toluidine | 3 |

| | |
|--|---------------|
| Myosmine | 3,5 |
| Myristic acid | 5 |
| N'-Nitrosoanabasine | 1,3 |
| N'-Nitrosoanatabine | 1,3 |
| N'-Nitrosonornicotine | 1,3,4,6,7,8 |
| Naphthalene | 2,5,6 |
| Naphtho[2,3-b]pyrene | 3 |
| Neophytadiene | 3 |
| n-Hentriaccontane | 6 |
| Nickel | 1,4,5,6,7,8 |
| Nicotinamide | 5 |
| Nicotine | 1,3,4,5,6,7,8 |
| Nicotine-N'-oxid | 3 |
| Nicotinic acid | 5 |
| Nicotrine | 3 |
| Nicotyrine | 5 |
| Nitrobenzene | 6 |
| Nitrogen oxides | 3,4,6,8 |
| Nitromethane | 6 |
| N-Methylmyosmine | 5 |
| N-Methylpyrrolidine | 6 |
| N-Nitrosodiethanolamine | 1,3,4,7,8 |
| N-Nitrosodiethylamine | 1,3,4,6,7,8 |
| N-Nitrosodimethylamine | 1,3,4,6,8 |
| N-Nitroso-di-n-butylamine | 1,3,6,7 |
| N-Nitrosodi-n-propylamine | 3,6 |
| N-Nitrosoethylmethylamine | 1,3,6 |
| N-Nitroso-n-methylethylamine | 3,7 |
| N-Nitrosopiperidine | 3,6,7 |
| N-Nitrosopyrrolidine | 1,3,4,6,7,8 |
| NNK | 1,3,4,6,8 |
| 4-(N-methyl-N- nitrosamino)-1-(3-pyridyl)-1-butanone | |
| Nonylic acid | 5 |
| Nornicotine | 3,5 |
| Nornicotyrine | 3,5 |
| Norphytene | 3 |
| o-Anisidine | 7 |
| Obeline | 5 |
| o-Cresol | 1,3,5 |
| Oleic acid | 3,6 |
| Oleic acid | 5 |
| o-Toluidine | 3 |
| Oxalic acid | 5 |
| Palmitic acid | 3,5,6 |
| Palmitoleic acid | 5 |

| | |
|------------------------------------|-------------|
| Palmitone | 5 |
| p-Cresol | 1,3,5 |
| Perylene | 3,5 |
| Phenanthrene | 2,3,5 |
| Phenanthridine | 3 |
| Phenol | 1,3,4,5,6,8 |
| Phenylacetylene | 5 |
| PhIP | 6 |
| Phthalic acid | 5 |
| P-Hydroxyacetophenone | 5 |
| Phytadienes | 5 |
| Phytol | 3 |
| Phytone | 3 |
| Picoline | 5 |
| Plastoquinone | 3 |
| Poikiline | 5 |
| Polonium-210 | 3,4,6,8 |
| Potassium | 5 |
| Propane | 5 |
| Propionaldehyde | 1,5 |
| Propionic acid | 5,6 |
| Propylbenzene | 5 |
| Propylene | 5 |
| Propylene oxide | 5,6 |
| p-Toluidine | 3 |
| Pyndine | 6 |
| Pyrene | 3,5 |
| Pyridine | 1,3,4,5,6,8 |
| Pyridine-3-aldehyde | 5 |
| Pyrrole | 1,5,6 |
| Pyrrolidine | 6 |
| Pyrrolo[2,3-b]pyridine | 3 |
| Pyruvic acid | 5 |
| Quinoline | 1,3,4,5,6,8 |
| Quinoxaline | 3 |
| Reductive acid | 5 |
| Resin acid | 5 |
| Resorcinol | 1,3,5 |
| Scopoletin | 3,5,6 |
| Scopoletin- β -gentiobioside | 3 |
| Scopolin | 3 |
| Sitosterol | 3,6 |
| Skatole | 6 |
| Sodium | 5 |
| Solanesenes | 3 |

| | |
|--------------------|---------------|
| Solanesol | 3,5,6 |
| Solanone | 3 |
| Squalene | 3,5 |
| Stearic acid | 3,5,6 |
| Stigmasterol | 3,5,6 |
| Strontium | 5 |
| Styrene | 1,6,7 |
| Succinic acid | 3,4,5,8 |
| Succinic anhydride | 3 |
| Thiocyanogen | 5 |
| Titanium | 5 |
| Tolune | 1,3,4,5,6,7,8 |
| Triethylene glycol | 5 |
| Trimethylamine | 5 |
| Triphenylene | 2,3 |
| Trp-P-1 | 6 |
| Trp-P-2 | 6 |
| Urethane | 1,3,7 |
| Veleric acid | 5 |
| Vinyl chloride | 1,3,6,7 |
| Xylenes | 1 |
| Xylenols | 3 |
| Zinc | 4,5,8 |

REFERENCES

1. Fowles J., Bates M., Noiton D. (2000). *The Chemical Constituents in Cigarettes and Cigarette Smoke: Priorities for Harm Reduction*. A report to the New Zealand Ministry of Health. Epidemiology and Toxicology Group. Kenepuru Science Center. March 2000.
2. Gundel L.A., Mahanama K.R.R., Daisey J. (1995). Semivolatile and Particulate Polycyclic Aromatic Hydrocarbons in Environmental Tobacco Smoke: Cleanup, Speciation, and Emission Factors. Environ. Sci. Technol. Vol. 29, pp. 1607-1614.
3. IARC (1986). International Agency for Research on Cancer. *IARC Monographs on the Evaluation of Chemicals to Humans. Tobacco Smoking*. Volume 38. IARC Lyon, France.
4. Jenkins R.A., Guerin M.R., Tomkins B.A. (2000). *The Chemistry of Environmental Tobacco Smoke: Composition and Measurement*.
5. Johnstone R.A.W., Plimmer J.R. (1959). *The Chemical Constituents of Tobacco and Tobacco Smoke*. Medical Research Council, The University, Exeter, England.
6. NIH (2001). *Risk Associated with Smoking*. Cigarette Design Monograph 13. National Institute of Health. National Cancer Institute.
7. OEHHA (1997). *Health Effects of Exposure to Environmental Tobacco Smoke*. Office of Environmental Health Hazard Assessment Final Report . California Environmental Protection Agency.
8. NRC (1986). Environmental Tobacco Smoke. *Measuring Exposures and Assessing Health Effects*. National Research Council. National Academy Press, 2101 Constitution Avenue, NW, Washington, D.C. 20418, p. 337.